Technical Integrity Assurance For Product Development

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The Story

- **Technical Integrity (TI) is quality, affordability, and customer satisfaction**
- **TI is an objective of the Systems Engineering process and is a function of process maturity**
- **A good indicator of the need for process reengineering is lack of information sharing**
- **An architecture framework is a good tool for reengineering product development**
- **The DoD Architecture Framework (DoDAF) is a good choice for identifying capability problems and solutions**
- **We will show an example of using the DoDAF framework to improve the process**

Technical Integrity For Product Development is

JSF: Multi-Role, Multi-Service, Multi-National

… Quality, Affordability, and Customer Satisfaction

Quality

- ✓ Prediction of technical performance
- ✓ Rapid capability trades
- ✓ Errors found and corrected early

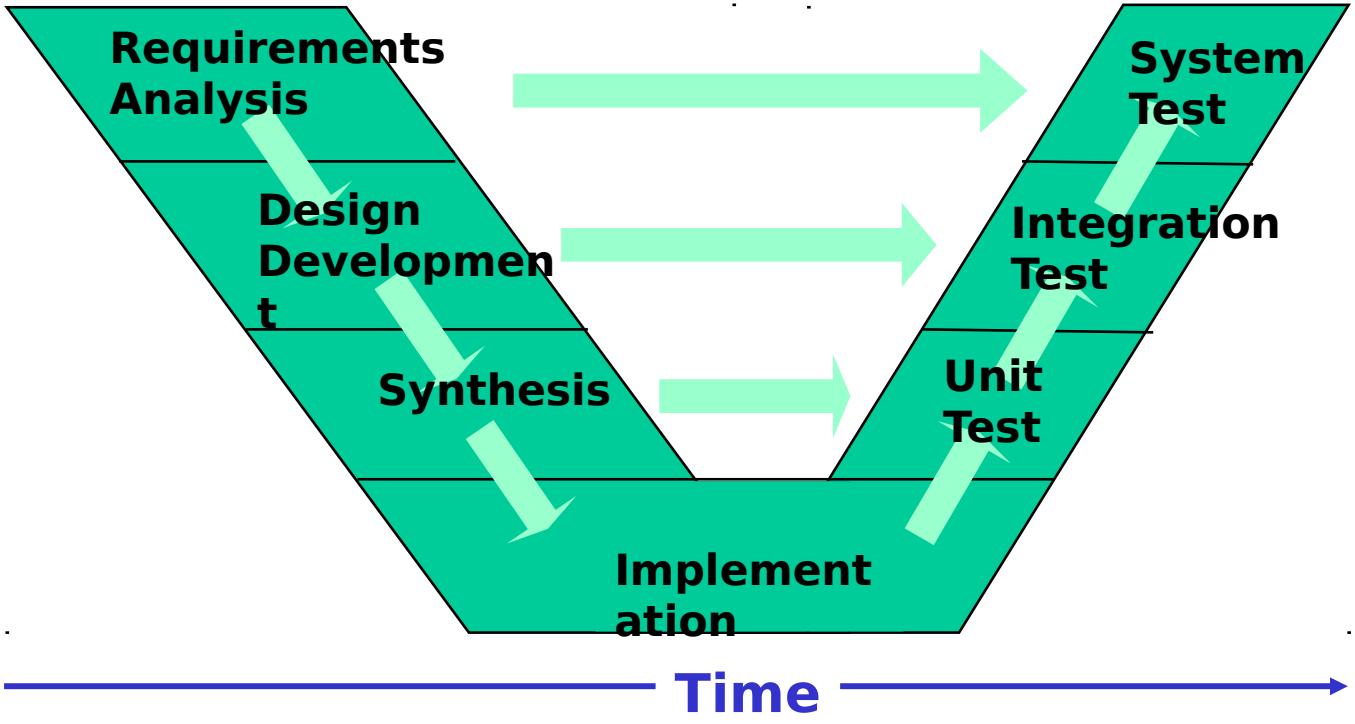
Affordability

- ✓ Elimination of Non-value added process steps and work products
- ✓ Reuse of simulation assets
- ✓ Reduction in development cycle
- ✓ Quality supplier management
- ✓ Timely access to & updates to engineering data
- ✓ Accurate cost modeling
- ✓ Parts replacement & repair data

Customer Satisfaction

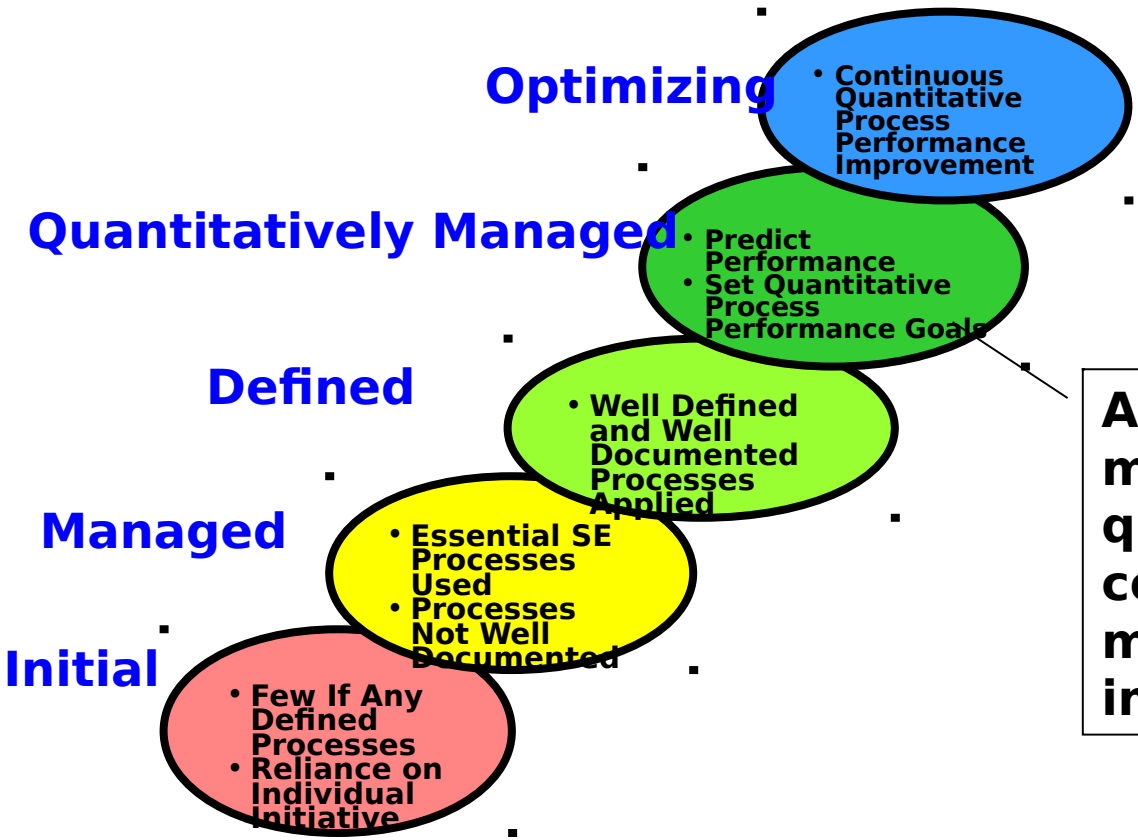
- ✓ Quantification and analysis of performance before implementation

Technical Integrity Is The Objective Of Product Development



The product development process is the mechanism to ensure the product meets the requirements and satisfies the customers expectations.

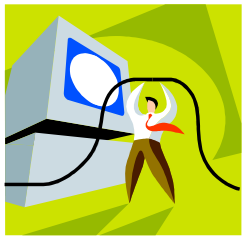
Technical Integrity Assurance is a Function of the Level of Process Capability Maturity



Accurate quantified measurement to predict quality schedule, and cost problems, and minimize technical impacts.

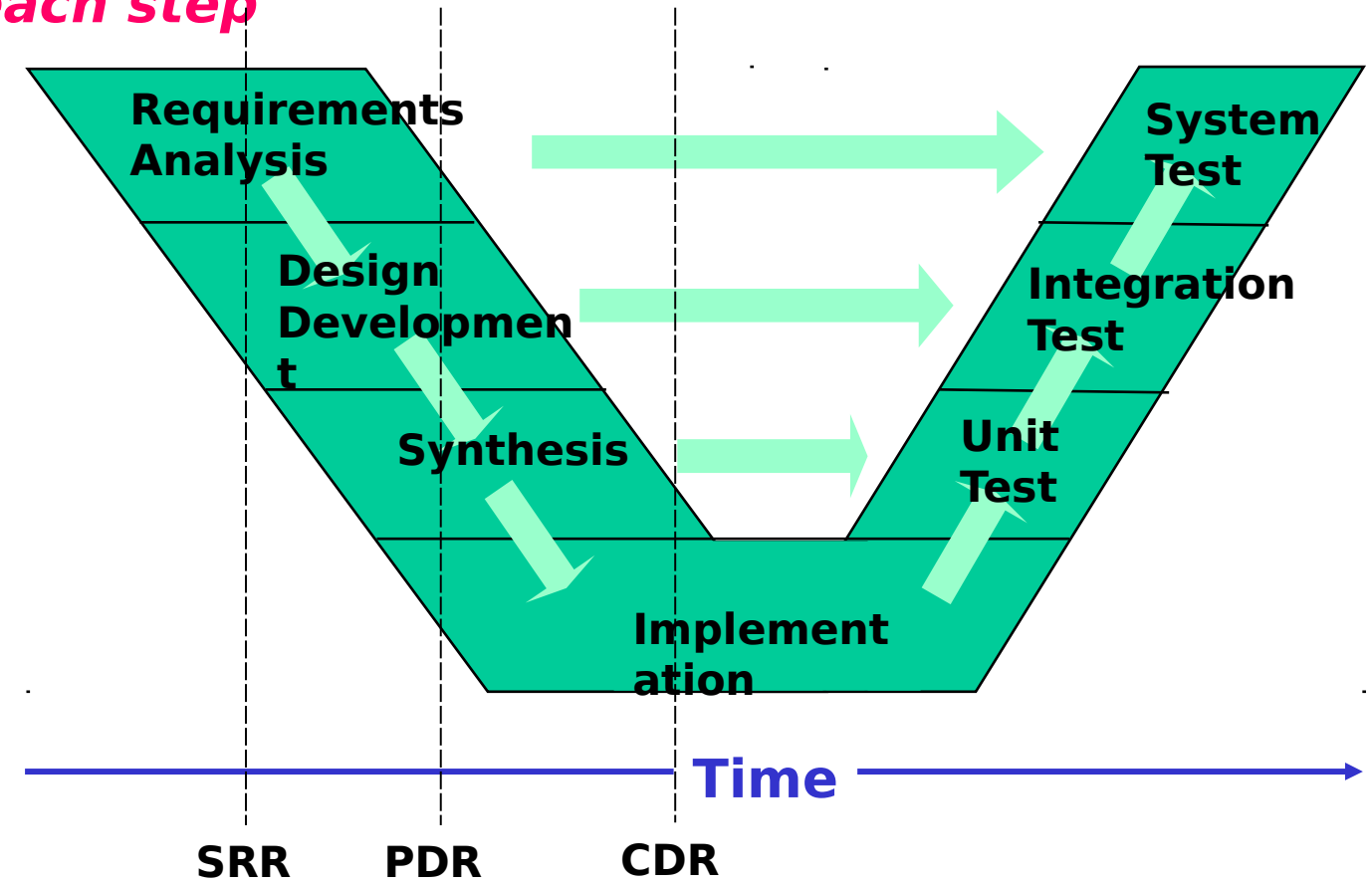
Process Maturity Can Be Assessed By Measuring Information Sharing Capability

- To what extent do our engineers have 24/7 access to required data?
- To what extent do our engineers understand the data they get and its appropriate use?
- To what extent can we prove to anyone that our data is traceable to trustworthy sources?
- To what degree do we have logical consistency between data sets?
- What is the latency between identification of tool input data need and initialization of the tool with the data?



A Direct Characteristic of a Mature Process Enabling Technical Integrity is…

… Incremental quantified verification and validation at each step



ot Measure The Design State, Then Cannot Predict and Control P

Process Immaturity is Correlated With High Information Latency and Inconsistent Data

… which causes cost and schedule overruns

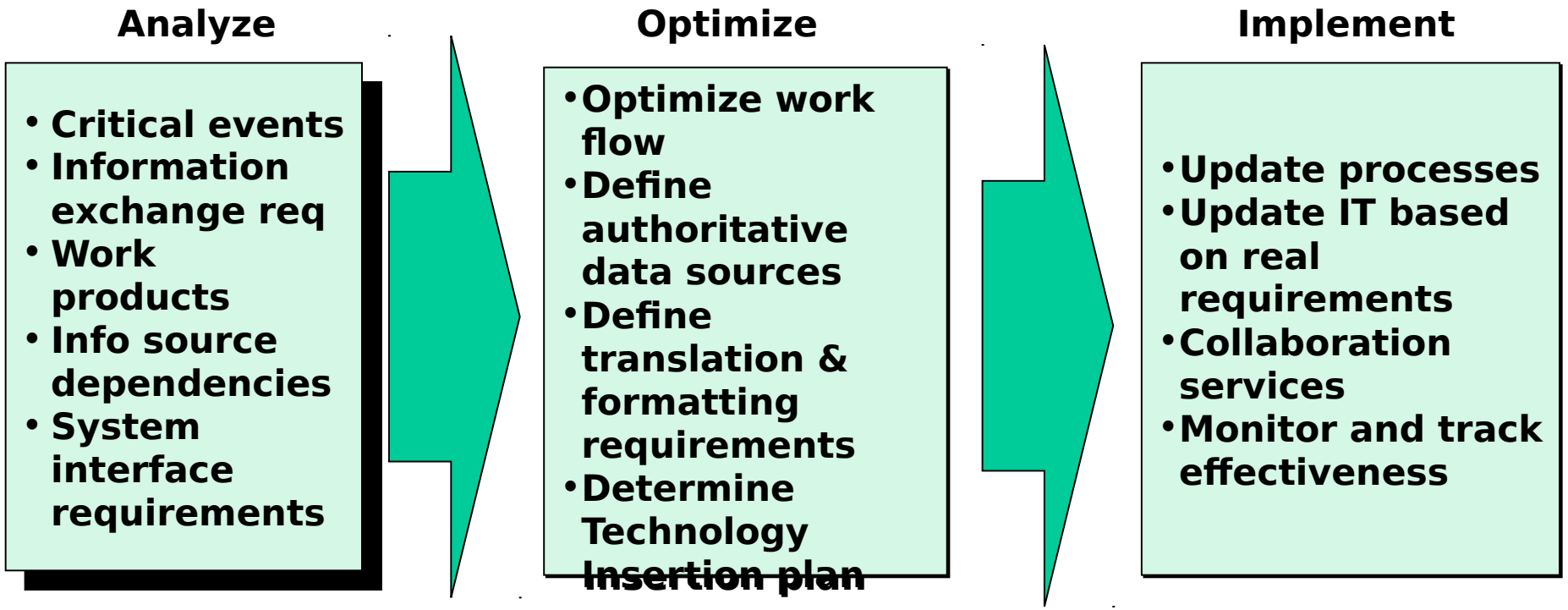
- **Large number of applications producing data which cannot share without human intervention**

…latency due to excessive manual intervention

- **Product data is configuration controlled but is often inconsistent**

…inconsistency due to redundant entry with only manual inspection for validation of consistency

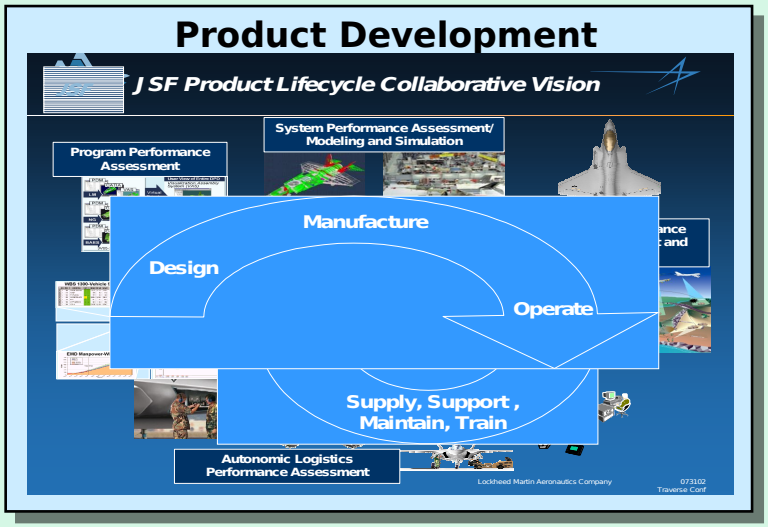
The Systems For Product Development Can Be Reengineered To Improve Capability Maturity

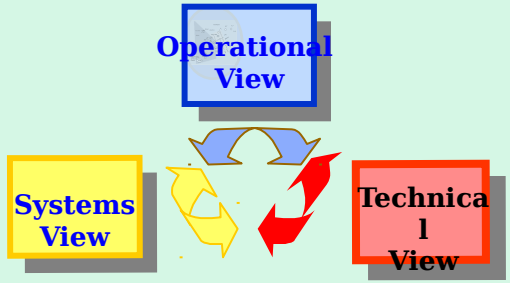


chitecture framework is a good tool for this reenginee

Applying DoDAF To Product Development Identifies Capability Problems and Solutions

Focus on this …

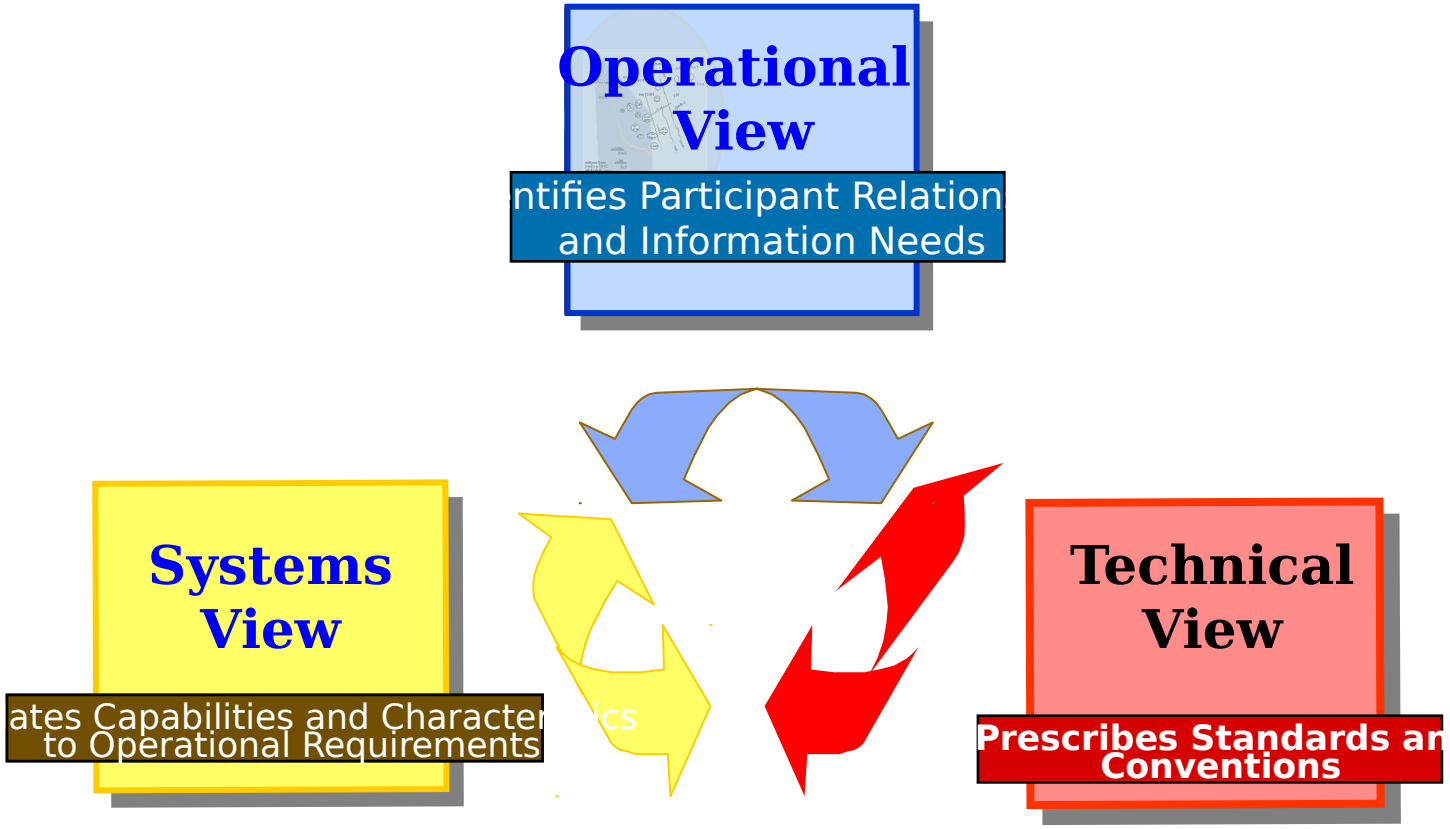




DoD Architecture Framework Views

… to produce this

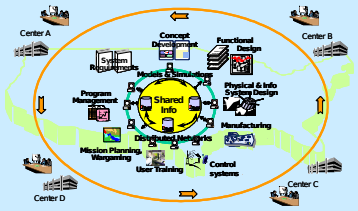
The DoD Architecture Framework is Comprised of Three Views



ork Products help identify required info flow and conn

We Are Using DoDAF Work Products To Analyze And Optimize Product Development

HIGH-LEVEL OPERATIONAL GRAPHIC (OV-1)

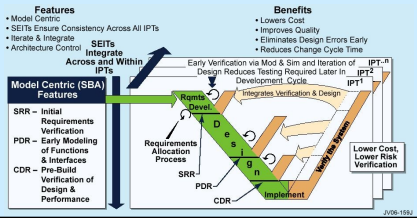


TECHNICAL STANDARDS PROFILE (TV-1)

TRMs Services View		
Application Software		
SUPPORT APPLICATIONS		
SERVICE AREA	SERVICE	STANDARD
Communications Applications	Web Applications	Component: Internet Explorer Version 4.X or better
		Component: Netscape Version 3.X or better

Operational concept roles & missions set scope

OPERATIONAL ACTIVITY MODEL (OV-5)

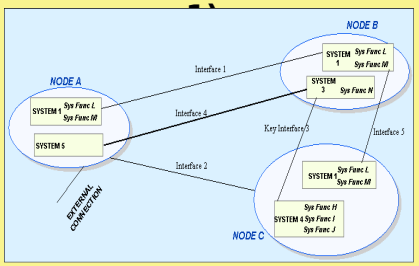

Features
Benefits
Model Centric (SBA) Features
SRR – Initial Requirements Verification
PDR – Early Modeling of Functions & Interfaces
CDR – Pre-Build Verification of Design & Performance
Requirements Allocation Process
Lower Cost, Lower Risk Verification
Implement

- Activities & performers map to nodes
- I/Os map to needlines

OV-1 connectivity and information exchanges map to node connectivity needlines and information exchanges

Standards apply to systems, components, and data exchanges among systems

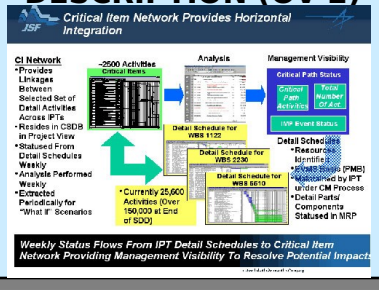
SYSTEMS INTERFACE DESCRIPTION (SV-



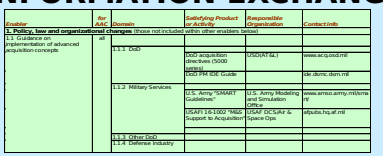
Activity inputs & outputs

Information exchanges associated with each node are detailed in OV-3

OPERATIONAL NODE CONNECTIVITY DESCRIPTION (OV-2)


Critical Item Network Provides Horizontal Integration
JSF
CI Network
•Provides Linkages Between Selected Set of Detail Activities Across IPTs
•Resides in CSDB in Project View
•Statused From Detail Schedules Weekly
•Analysis Performed Weekly
•Extracted Periodically for "What If" Scenarios
~2500 Activities Critical Risks
Analysis
Management Visibility
Critical Path Status
Detail Schedule for WBS 1122
Detail Schedule for WBS 2230
Detail Schedule for WBS 6510
Detail Schedules
•Resources Identified
•EVMS Issues (PMB) Established by IPT under CM Process
•Detail Parts/ Components Statused in MRP
•Currently 25,600 Activities (Over 150,000 at End of SDD)
Weekly Status Flows From IPT Detail Schedules to Critical Item Network Providing Management Visibility To Resolve Potential Impacts

OPERATIONAL INFORMATION EXCHANGE



- Operational nodes are associated with systems and system components
- Each operational needline maps to one or more system links

We Have Piloted Development of OV-5 and OV-3

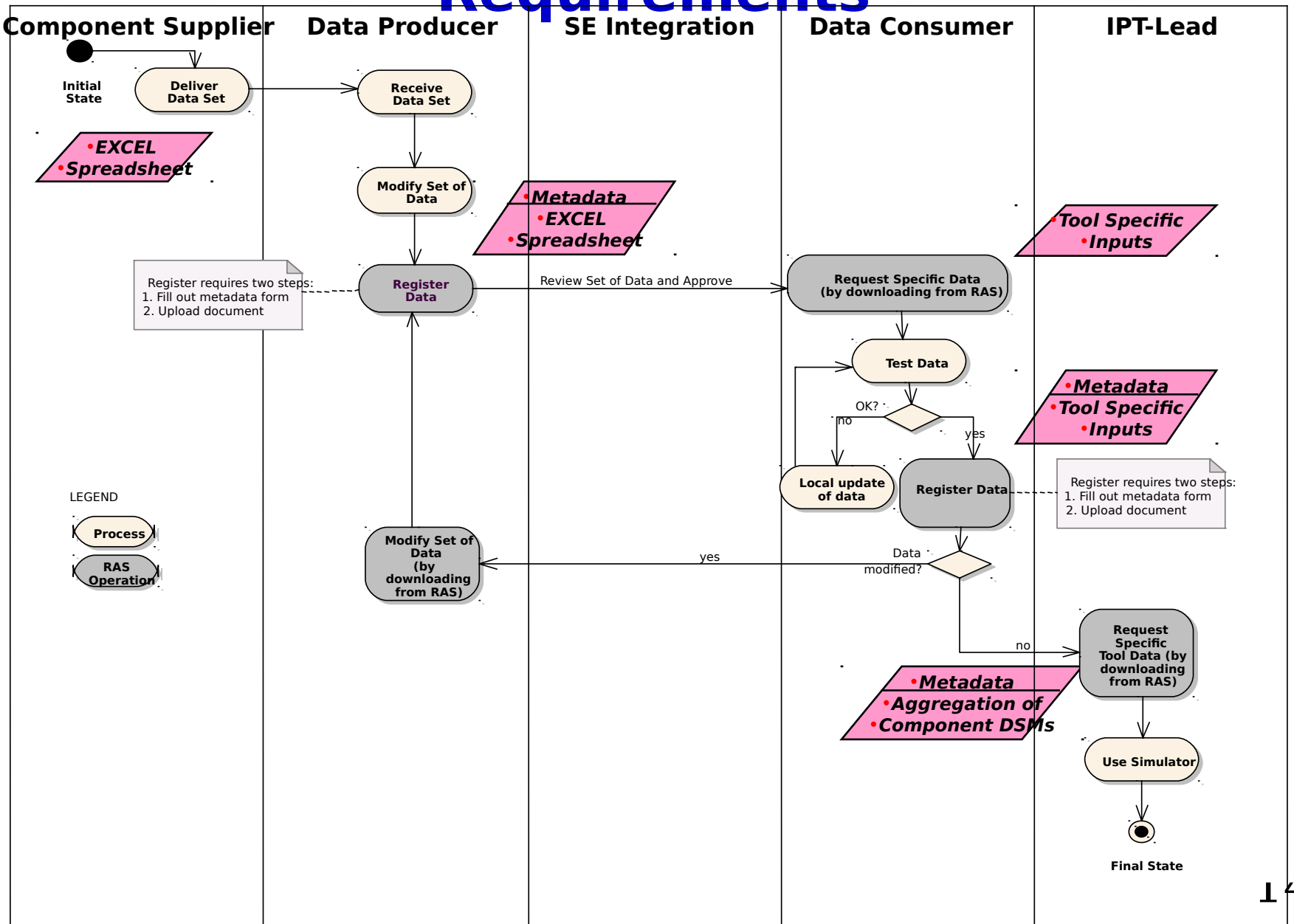
OV-5 Operational Activity Model

- Activities that take place to accomplish mission
- Performing organization
- Associated need line identifiers
- Time to accomplish

OV 3 Operational information Exchange matrix

- Producer
- Consumer
- Content of information to be exchanged
- Task it supports
- Triggering event
- Communication medium
- Information format (include any standard being followed)
- Periodicity
- Time to exchange information
- Time to understand information
- Time to transform information into consuming tool’s format
- Classification/confidentiality

Example of Activity Diagrams Used To Produce Information Exchange Requirements



Summary

Small Picture (Pilot Effort)

- **Standard process diagrams did not reflect how teams really worked, or should work**
- **OV-5: Activity diagrams of "as is" process turned up both required interfaces and inefficiencies**
- **OV-3: Constructing IERs allowed us to optimize process and get IPTs to buy in**
- **OV-7: had to specify logical data model**
- **SV-1: Turned up connectivity deficiencies**

Big Picture

- **Technical Integrity Assurance is the result of mature process**
  - With supporting infrastructure
- **Information sharing, or its lack, is a good measure of process maturity**
- **DoDAF is a good tool for re-engineering product development and for use in achieving CMMI maturity**